Terraces & Contour Bunds

A guide to effective soil and water conservation for agricultural lands in Northern Kenya

KENYA
Resilient Arid Lands Partnership for Integrated Development
Building Resilience Together

FOOD FOR THE HUNGRY

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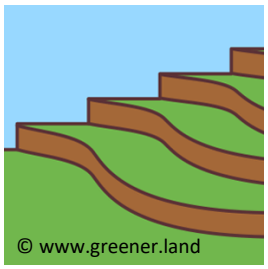
Description

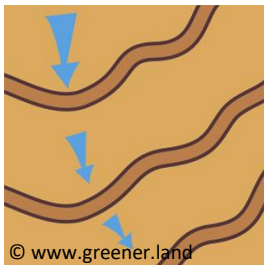
Terraces

Platforms or benches built along a slope to make hilly areas arable. Terraces usually follow the contour lines of a terrain and might have a gentle slope to allow dewatering.



Contour bunds

Contour bunds and contour trenches prevent soil erosion by intercepting surface water runoff. They are constructed along lines of equal elevation (contour lines) at a right angle to the slope of a plot of land.



Purpose

- Reduce surface water flow velocity
- Enhance infiltration, thereby recharging soil moisture and groundwater
- Prevent soil erosion and washing-out of nutrients
- Prevent silting of water bodies
- Construct a level crop field that can be easily worked

Terraces, contour bunds and trenches should ideally be implemented in combination with other practices of sustainable agriculture, such as agroforestry, farmer managed natural regeneration (FMNR) and sustainable rangeland management.

Contour trenches with strips of Napier grass, *Gatwamkiwa village, Central Province, Kenya* © Laura D'Aietti

Construction of stone bunds, Niger © PASP, GIZ

Newly constructed bench terraces planted with hedge rows, *Kagyera village, Kabale District, Kenya* © Kenneth Twinamasiko

Where to apply it

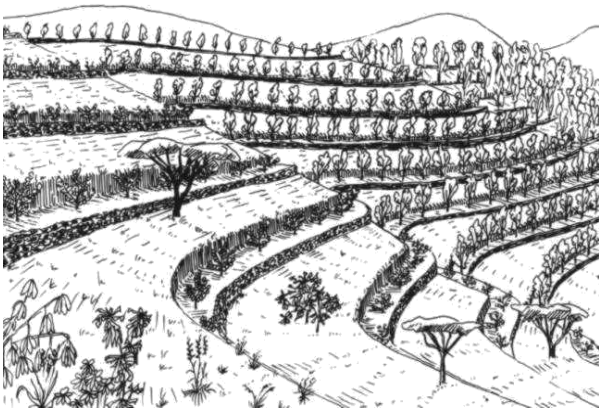
Terraces, contour bunds and contour trenches are erosion control and water retention measures that can be used on agricultural fields, especially in semi-arid and sub-tropical climates.

	Terraces	Contour bunds
Slope	10 - 50% = 1 - 5 m elevation gain for every 10 m horizontal distance	0.5 - 10% = 0.5 - 1 m elevation gain for every 10 m horizontal distance
Soil	More than 1.5 m thick permeable soil, preferably no clay: hard to work and low infiltration	More than 0.5 m thick preferably permeable soil
Gullies	There should be NO or only small erosion gullies or rills present on the field (<0.5 m deep). Gullies should be filled or intercepted with check dams, so that waterflow during heavy rains does not destroy the terrace / contour bund.	

Construction

Terraces

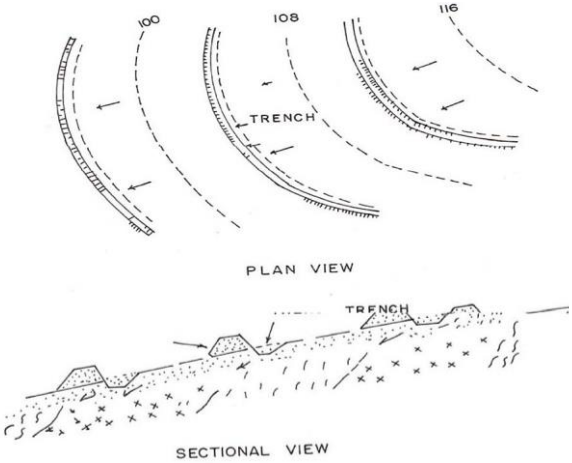
- The terrain is dug out upslope and the excavated material is used downslope to create a level platform. The fertile topsoil should be separated and reapplied on the top of the terraces
- The downslope walls are best constructed of stones. They can also be made of soil, reinforced by vegetation such as vetiver grass.
- The walls should be sturdy, well protected from erosion and should not exceed 2 m in height.
- Optionally, every terrace can have a drainage ditch just above the ridge that collects water and channels it to the next step this can be helpful in preventing erosion.
- The platform might have a gentle slope to allow dewatering.



© Soil conservation in Ethiopia (CFSCDD 1986)

Contour bunds

- Can be built of soil and/or stones.
- Are often constructed parallel to an infiltration trench (ditch). The excavated soil from the trench is then placed downslope along the edge of the trench to form the bund (dyke).
- Optional: Build cross-ties every few meters. These are small earth walls or excavated trenches, perpendicular to the bunds, that subdivide the system into micro catchments and prevent lateral flow along the bund which might cause erosion.
- Plant native grasses, legumes or perennials on the bunds to stabilize them. Apply mulch, especially while the plants develop roots.



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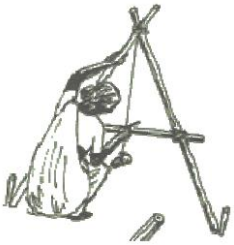
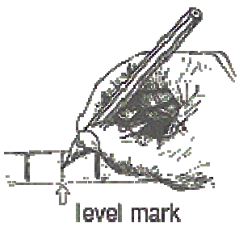
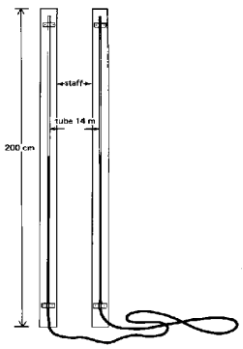
Making simple surveying tools

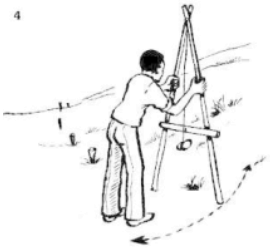
For measuring the slope of a field and for marking contour lines along, you can build your own surveying tools.

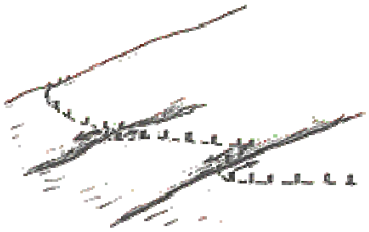
	The A-Frame	The level hose
Materials needed	• 2 poles about 2 meters long • 1 shorter pole about 1 meter long • some string • a stone	• 2 poles about 2 meters long • Clear plastic tubing about 10-25 meters long and about 2 cm in diameter • Some string or adhesive tape • Optional: measuring tape (2 x 1 m)
Step 1	Tie the poles very tightly together to make the shape of a letter A. Hang the stone from the top of the A-Frame, making sure the stone hangs below the cross bar. 	Tie the measurement tapes to the two poles. Tie the ends of the tubing securely to the two poles in several places so that the ends are in the middle of the measuring tape. 
Step 2	Holding the frame upright, mark with two sticks exactly where the poles touch the ground. When the stone stops moving, mark where the string crosses the cross bar. Turn the A-Frame around, placing the poles in exactly the positions marked by the two sticks. Again, mark where the string crosses the cross bar. 	Carefully fill the tubing with clean water, making sure no air bubbles are trapped inside, until nearly full. Hold the poles side by side, with their lower ends resting on the ground, until the water level settles at exactly the same level on each pole. Mark this level clearly on each pole. 
Step 3	Mark the level mark on the cross bar - exactly half way between the previous two marks. If the first two marks happen to be on the same place - this is the level mark with both poles touching the ground two points of equal elevation can be found by pivoting (turning) the A frame until the string hangs right in front of the level mark.  	When moving the poles, either use a thumb or fit plastic stopper to prevent water spilling - these should be removed before measuring. The difference between the water level and the level mark is the difference in elevation and can be read of the measuring tape. If the water levels at both ends of the tube are at the level mark two points of equal elevation have been found. 

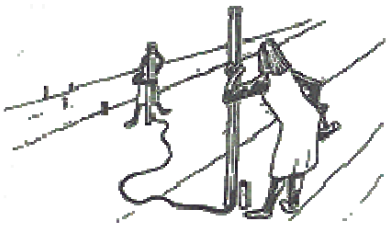
Marking the contour lines

Contour lines are imaginary lines that run at a right angle to the slope of your plot of land. All points on one contour line have the same elevation – water cannot flow along contour lines because it is completely level. Contour lines must be measured and marked in the field, they cannot be guessed.

- Collect some sticks
- Begin at one side of the field where you want the first contour line to begin
- **A-Frame** (for steeper slopes and low plants)
  Move the A-Frame along, by turning it around (pivoting), keeping pole 1 in exactly the same place. Move pole 2 until the string touches the level mark and place another stick into the ground by pole 2. Carry on in this way, pivoting the A-Frame across the field.
- **Level hose** (for flat fields and high plants)
  One person stands still while the other moves their pole until the level mark is reached in both poles. As with the A-Frame, use marker sticks and move alternate poles so that any slight faults with the hose level do not affect the contour line.



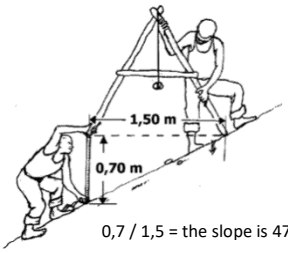




Spacing interval

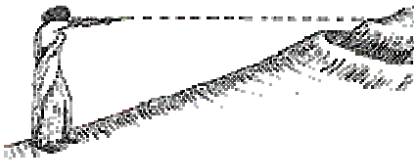
The distance between one terrace or contour bund and the next one downhill depends on the slope of the field. The table provides suggestions for how much space to allow between terraces or bunds based on slope percentage (= vertical / horizontal distance). Alternatively, trenches should be one adult human's height apart in elevation.

Slope	Spacing interval
Less than 1%	20 m
1 – 2%	15 m
2 – 4%	10 m
4 – 8%	8 m
8 – 15%	6 m
More than 15%	4 m or less



0,7 / 1,5 = the slope is 47%

Measuring the terrain slope with an A-Frame



estimating the position of the next bund

marking parallel contour lines

Maintenance

- Repair any damage to bunds and terraces before the start of the rainy season. Breaches need to be quickly repaired.
- If you notice that bunds or terraces get damaged frequently by runoff from heavy rains you might need to construct a diversion ditch that leads water away from your scheme.
- Grass should be allowed to grow on the bunds or terrace walls. The roots help to stabilize the structure.
- Trenches will fill with sediments and need to be cleaned out periodically.
- Don't let livestock graze directly on the bunds or terraces! Their hooves can cause damage.
- Make agreements on who is responsible for the maintenance of which part of the terraces or contour bunds.

Colophon Prepared by Acacia Water for IWRM activities in Marsabit as an assignment within the Kenya-RAPID program
The Netherlands, 2019 www.acaciawater.com https://mw awater.org